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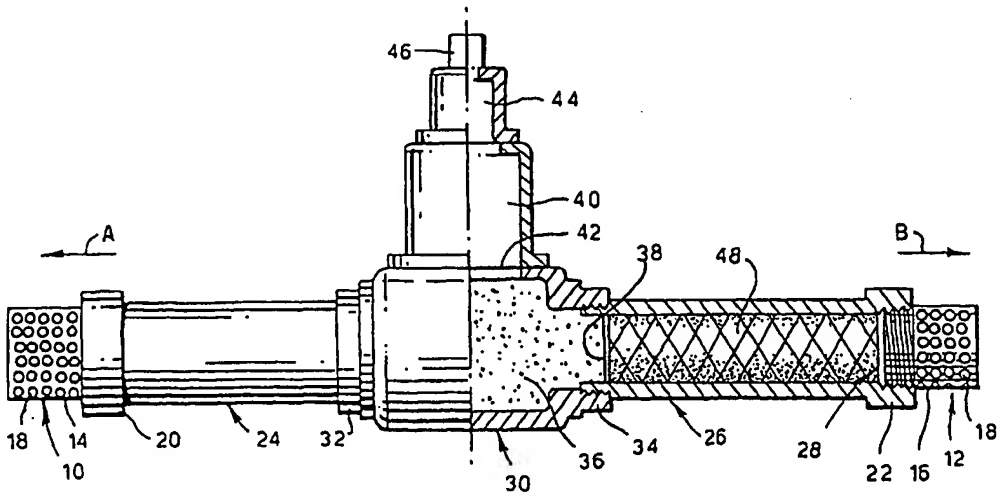
(54) Title: FIRE EXTINGUISHING AND EXPLOSION SUPPRESSION ARRANGEMENTS AND METHODS



(57) Abstract: A fire extinguishing arrangement comprises two tubular mains (24, 26) containing a volatile fire extinguishant such as FM 200 or FE 36, the extinguishant being retained between rupturable diaphragms (28, 38). When the extinguishant is to be discharged, a pyrotechnic gas generator (44, 46) is activated to produce high pressure gas in an expansion chamber (40) which is separated from a main chamber (36) containing an aqueous-based agent such as water by a rupturable diaphragm (42). The high gas pressure ruptures the diaphragm (42) and the high pressure is applied to the extinguishant via the water in the main chamber (36). The diaphragms (38, 28) retaining the extinguishant rupture and the extinguishant is ejected through discharge holes (18) in discharge nozzles (14, 16). The water quenches the high temperature gases from the pyrothechnic gas generator (44, 46), thus preventing pyrolysis of the fire extinguishant and the creation of harmful and deleterious by-products. Any water ejected with the fire extinguishant will also perform an extinguishant function.

WO 00/72922 A1

FIRE EXTINGUISHING AND EXPLOSION SUPPRESSION ARRANGEMENTS AND METHODS

The invention relates to a fire extinguishing arrangement, comprising means for retaining a fire extinguishant ready for discharge through discharge outlet means in response to sufficiently high applied pressure, pressure generating means for producing the high pressure when discharge of the extinguishant is required, and pressure applying means for indirectly applying the pressure to the extinguishant. The invention also relates to a fire extinguishing arrangement, comprising means for retaining a fire extinguishant ready for discharge through discharge outlet means in response to sufficiently high applied pressure, pressure generating means for producing the high pressure when discharge of the extinguishant is required, and pressure applying means for indirectly applying the pressure to the extinguishant. For ease of reference herein, the terms "fire extinguishing" and "fire extinguishants" are used to include explosion suppression and explosion suppressants, and the term "fire" is used to include "explosion".

Such an arrangement and method are described in EP-A-0 750 924. A problem with this arrangement and method is that the pressure applying means comprises a piston-cylinder arrangement. Therefore, it requires several mechanical parts which are susceptible to wear or malfunction such as in the case where a long period elapses before use.

This invention aims to overcome this problem. According to the invention, therefore, the

arrangement as first set forth above is characterised in that the pressure applying means comprises retaining means for retaining a quantity of an inert fluid interposed between the pressure generating means and the extinguishant.

According to the invention, also, the method as first set forth above is characterised in that the high pressure is indirectly applied to the extinguishant via the intermediary of an inert fluid.

Fire extinguishing arrangements and methods according to the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawing which is a side view, partly in section, of one of the arrangements.

The fire extinguishing arrangement to be described is particularly (though not only) suitable for extinguishing fires or explosion within the crew compartments of military vehicles such as tanks or armoured personnel carriers - where the fires or explosions are likely to be constituted by burning hydrocarbons.

The arrangement shown in the Figure is, in this example, intended to discharge fire extinguishant in two directions A and B through respective discharge nozzles 10 and 12. In this example, each nozzle 10,12 comprises a respective cap 14,16 which is closed off at one end and has a large number of discharge holes 18 in its side wall. The other end of each cap 14,16 is sealingly mounted within a respective collar 20,22 which is integrally

positioned at the end of a respective pipe or main 24,26. Each collar 20,22 also supports a respective thin sealing diaphragm 28; the diaphragm supported by collar 20 is not visible in the Figure. The diaphragms 28 close off the otherwise open inner ends of the caps 14,16, thus preventing communication between the hollow interior of each main 24,26 and the respective discharge nozzles 10,12.

The mains 24,26 are sealingly connected to openings in a central body 30 by means of respective collars 32,34. The central body 30 includes a main chamber 36. This is sealed off from the interiors of the mains 24,26 by respective sealing diaphragms 38 which are supported by the collars 32,34; the diaphragm 38 supported by collar 32 is not visible in the Figure.

The central body 30 also includes a hollow expansion chamber 40 which is sealed off from the main chamber 36 by a further sealing diaphragm 42.

A suitable pyrotechnic gas generator 44 with a suitable igniter 46 is mounted on top of the expansion chamber 40.

In use, the hollow interiors of the mains 24,26 are filled with a suitable fire extinguishant 48 such as a volatile agent. FM 200 and FE 36 are suitable examples. They are efficient for extinguishing hydrocarbon fires and not significantly injurious to human health. The extinguishant is held sealingly within each main so that each main is completely filled

under pressure with the extinguishant.

The main chamber 36 is filled with an acqueous agent such as water, preferably with an additive such as a potassium salt to inhibit freezing of the water and constitute a chemical fire suppressant. Potassium lactate is a suitable additive.

In the event of a fire or explosion within the area to be protected, the igniter 46 is energised to ignite the pyrotechnic gas generator 44,46. The gas generator may be energised manually or automatically by a fire detector. Within a very short time (a few milliseconds), the pyrotechnically generated gas expands into the expansion chamber 40 and bursts the sealing diaphragm 42, applying a high pressure of the order of 7MPa to the water within the main chamber 36). This pressure is instantly transmitted by the water to and bursts the two diaphragms 38, applying the high pressure to the extinguishant filling each main 24,26. The diaphragms 28 at the outer ends of the two mains thus also burst and the extinguishant is ejected through the holes 18 in the discharge nozzles 10,12. Extinguishant discharge will take place without any significant delay because each main is completely filled with the extinguishant which is therefore present immediately adjacent the discharge nozzles, ready to be discharged as soon as the requisite pressure is generated by the gas generator.

The presence of the water ensures that the very hot gases produced by the gas generator are not applied directly to the fire extinguishant. These gases are cooled by the water

which also quenches any flames produced by the gas generator. In the absence of the intervening water, the hot gases from the gas generator could pyrolize the extinguishant agent producing hydrogen fluoride and other undesirable by-products - which would be potentially injurious to occupants of the crew compartment and would also reduce the effectiveness of the fire extinguishant.

In addition, of course, any water which is ejected through the discharge nozzles with the extinguishant will also have extinguishing capability, which will be enhanced by the potassium lactate or other additive.

It will be appreciated that the constructional layout of the arrangement shown in the Figure is merely given by way of example. Many other configurations are possible, in which water or other acqueous agent is used to transmit hot gas pressure to a volatile fire extinguishant in order to discharge the fire extinguishant, the water protecting the fire extinguishant from pyrolysis or other degradation caused by the hot gases and transmitting the pressure to the extinguishant.

CLAIMS

1. A fire extinguishing arrangement, comprising means (24,26) for retaining a fire extinguishant (48) ready for discharge through discharge outlet means (10,12) in response to sufficiently high applied pressure, pressure generating means (44,46) for producing the high pressure when discharge of the extinguishant (48) is required, and pressure applying means (36,38,42) for indirectly applying the pressure to the extinguishant (48), characterised in that the pressure applying means comprises retaining means (36,38,42) for retaining a quantity of an inert fluid (36) interposed between the pressure generating means (44,46) and the extinguishant (48).

2. An arrangement according to claim 1, in which the pressure generating means (44,46) comprises pyrotechnic gas generating means (44).

3. An arrangement according to claim 1 or 2, characterised in that the inert fluid (36) is a heat absorbing liquid with fire extinguishing qualities.

4. An arrangement according to any preceding claim, characterised in that the inert fluid (36) comprises an acqueous based liquid such as water.

5. An arrangement according to any preceding claim, characterised in that the extinguishant (48) is confined within a volume separated from the discharge outlet means

(10,12) by a rupturable diaphragm (28).

6. An arrangement according to any preceding claim, characterised in that the means for retaining the inert fluid (36) comprises rupturable diaphragm means (38,42) for confining the fluid within a volume.

7. An arrangement according to claim 6, characterised in that the rupturable diaphragm means (38,42) for confining the inert fluid (36) comprises a first rupturable diaphragm (38) separating the inert fluid (36) from the extinguishant (48) and a second rupturable diaphragm (42) separating the inert fluid (36) from the pressure generating means (44,46).

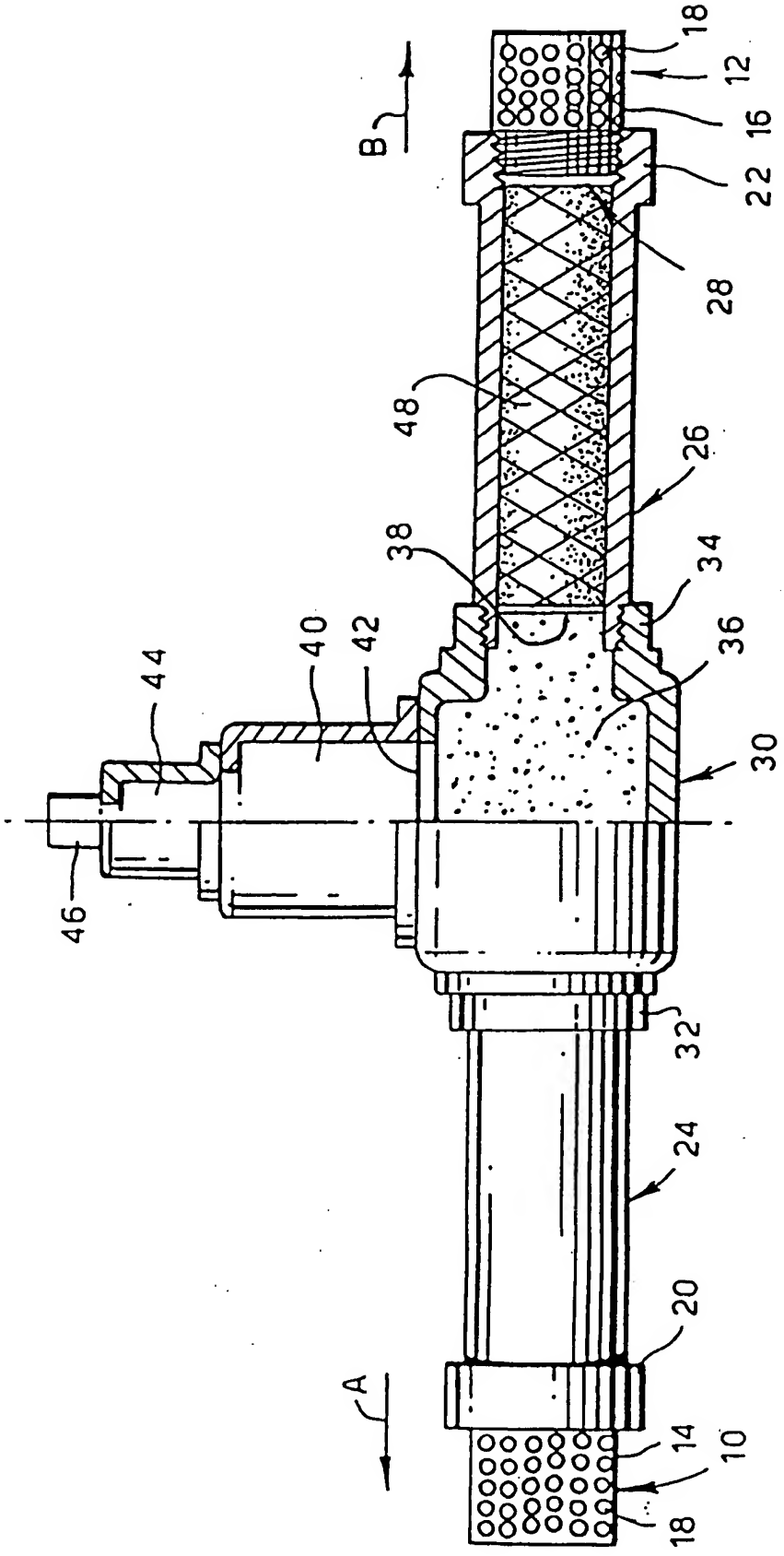
8. An arrangement according to any preceding claim, characterised in that the extinguishant (48) is a volatile extinguishant.

9. A method of fire extinguishing, comprising the step of ejecting a fire extinguishant (48) towards a fire by indirectly applying high pressure to the extinguishant (48), characterised in that the high pressure is indirectly applied to the extinguishant (48) via the intermediary of an inert fluid (36).

10. A method according to claim 9, characterised in that the high pressure is produced by pyrotechnically generating high pressure gas and characterised in that the inert fluid

(36) is a heat-absorbing and flame-quenching liquid.

11. A method according to claim 9 or 10, characterised in that the inert fluid (36) is an acqueous-based liquid such as water.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INTERNATIONAL SEARCH REPORT

rnational Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A62C13/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A62C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 750 924 A (KIDDE TECH INC) 2 January 1997 (1997-01-02) cited in the application the whole document ---	1
A	US 4 319 640 A (BROBEIL KARL R) 16 March 1982 (1982-03-16) column 4, line 26 - line 46; figure 5 ---	1
A	US 5 884 710 A (HUSSEY BRETT ET AL) 23 March 1999 (1999-03-23) -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
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1

INTERNATIONAL SEARCH REPORT

Information on patent family members

national Application No
PCT/GB 00/02050

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0750924 A	02-01-1997	US 5660236 A	26-08-1997
		CA 2180078 A	29-12-1996
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US 5884710 A	23-03-1999	NONE	